

1.0 EXECUTIVE SUMMARY

Maintaining Gloucester Harbor as a working harbor is a primary goal of the recently completed Gloucester Harbor Plan. In support of that goal, the Harbor Plan identifies dredging as a priority action, to support the many commercial and recreational facilities and uses that make the harbor what it is. The following facilities in Gloucester Harbor and the Annisquam River have reported a need to dredge:

- 16 industrial/commercial facilities
- 9 City landings
- 4 marinas
- The Fish Pier, the Annisquam River, and Smith Cove

To dredge these facilities, Gloucester needs a place to safely dispose of the dredged material. However, Gloucester harbor sediments are typical of the urban ports of the Northeast and contain contaminants as a result of years of industrial and commercial activities. These contaminants are potentially harmful to marine life, and much of the sediment therefore cannot be disposed of at the ocean site that was used frequently in the past. State and federal law requires that the sediment that cannot go to the ocean site must be “managed” to remove it from direct contact with the environment. The time and cost required to manage these sediments, by identifying environmentally responsible and cost-effective disposal sites, is often so great that marine facilities cannot afford to dredge.

Because maintaining working ports and harbors is so important in Massachusetts, the state, through Massachusetts Coastal Zone Management, and with funding and support from the Seaport Advisory Council, is working with the City of Gloucester to identify locally acceptable disposal sites for material dredged from Gloucester Harbor.

The purpose of this Draft Environmental Impact Report is to investigate all of the potential options available for the management or disposal of Gloucester Harbor dredged material, and to present for review and comment a recommended approach. Comments from the public, the City, and state and federal regulatory agencies on the information and recommendations in this DEIR will guide our continuing work with the City.

This summary of the Gloucester Harbor DMMP DEIR presents an overview of the full report contents, lists the principal environmental impacts of the alternatives for dredged material management and identifies measures to be implemented to mitigate unavoidable environmental impacts.

1.1 Name and Location of Project

The project described in this DEIR is the Gloucester Harbor DMMP, in Gloucester, Massachusetts. An Environmental Notification Form (ENF) was filed for the Gloucester Harbor DMMP on March 16, 1998, by Massachusetts Coastal Zone Management (MCZM) and the City of Gloucester, the project proponents. The location of Gloucester Harbor is shown in Figure 1-1. The Executive Office of Environmental Affairs (EOEA) file number for the Gloucester Harbor DMMP is 11534.

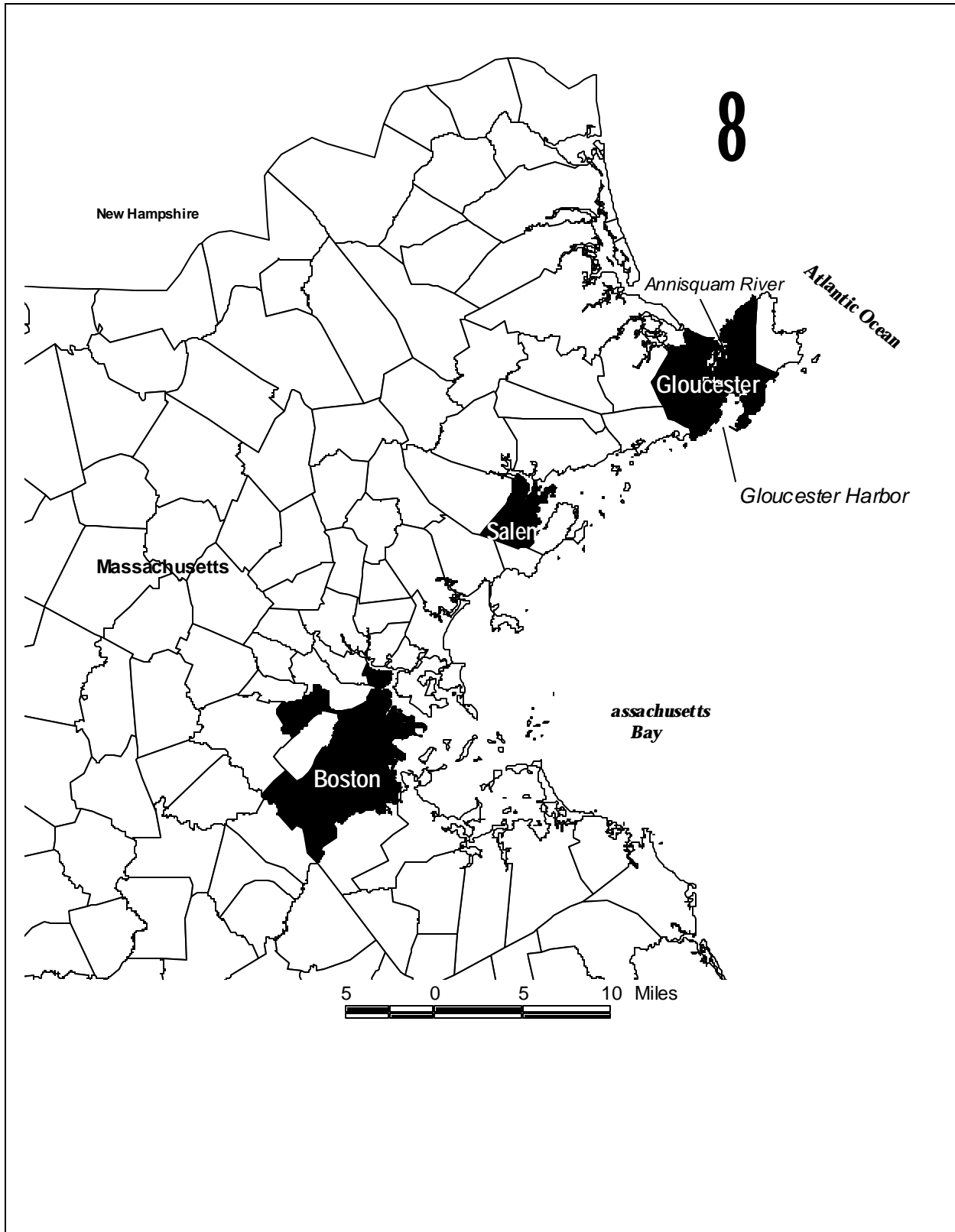


Figure 1-1: Location of Gloucester Harbor

1.2 Project Description

This DEIR includes an analysis of alternative upland and aquatic dredged material disposal sites and alternative technologies to treat sediments that are unsuitable for unconfined open water disposal (“unsuitable dredged material” or “UDM”) for eventual disposal or beneficial reuse. The DEIR identifies one preferred alternative for disposal of UDM, consisting of four Confined Aquatic Disposal (CAD) sites.

The DEIR recommends a single preferred alternative, with four aquatic disposal locations. Public comment will be invited on this DEIR in full compliance with the regulations implementing the Massachusetts Environmental Policy Act (MEPA). The preferred alternative will be evaluated by additional site specific analysis in the Final Environmental Impact Report (FEIR).

The Gloucester Harbor DMMP provides a mechanism for balancing existing and future needs for the disposal of UDM associated with the maintenance or improvement dredging of harbor facilities while maintaining existing environmental resources. The framework established in the Gloucester Harbor DMMP provides technical information in support of the harbor management goals of the City of Gloucester and the sound management of Gloucester’s environmental and maritime economic resources.

1.2.1 DEIR Development Process

The Gloucester Harbor DMMP DEIR was developed in close coordination with a working group representing diverse local interests. This group, the Gloucester Harbor Dredging Subcommittee, was appointed by the City as a subcommittee to the full Harbor Planning Committee, and now to the Harbor Plan Implementation Committee. Four (4) presentations and nine (9) working meetings and two (2) screening meetings on the management of dredged material were held with the Gloucester Dredging Subcommittee. In addition to the above, six (6) meetings were held with various recreational and commercial fishing interests to gather further local input on their understanding of the Gloucester Harbor and surrounding waters (Massachusetts Bay) marine environment.

This project has also been coordinated closely with State and Federal regulators with review jurisdiction over the disposal of UDM. Reviewing agencies have been involved at key project milestones, and their comments accordingly incorporated. This early coordination has been essential in developing the preferred alternative put forward in this report.

1.2.2 Public Comment Process

This DEIR represents a key milestone in the MEPA (Massachusetts Environmental Policy Act) review process for public comment. Upon notification of receipt of this DEIR by the Secretary of Environmental Affairs, in the *Environmental Monitor*, there will be a thirty-seven (37) day review period from the date of notification of the availability of the report. MCZM will coordinate with the City if an extension of the comment period is necessary. Comments on the Gloucester Harbor DMMP should be directed to MEPA:

Secretary
Executive Office of Environmental Affairs
Attention MEPA Office
EOEA No. 11534
251 Causeway Street, Suite 900
Boston, MA 02114-2150

All comments made on the Gloucester Harbor DMMP DEIR will be addressed in the Final Environmental Impact Report (FEIR), consistent with MEPA's purpose "to provide meaningful opportunities for the public review of potential environmental impacts" associated with the project. MCZM will continue to coordinate closely with the City in the development of the FEIR to provide opportunities for public involvement.

1.2.3 Purpose and Need

The purpose of the DMMP for Gloucester Harbor is to identify, evaluate and permit, within the upland and aquatic Zones of Siting Feasibility (ZSFs) for Gloucester Harbor (see Figures 1-2 and 1-3), dredged material disposal sites or management methods for the disposal, over the next twenty (20) years, of dredged material unsuitable for unconfined ocean disposal. The lack of practicable, cost-effective methods for the disposal of dredged material unsuitable for unconfined ocean disposal in an environmentally sound manner has been a long-standing obstacle to the successful completion of dredging projects in Gloucester Harbor and other harbors throughout the Commonwealth.

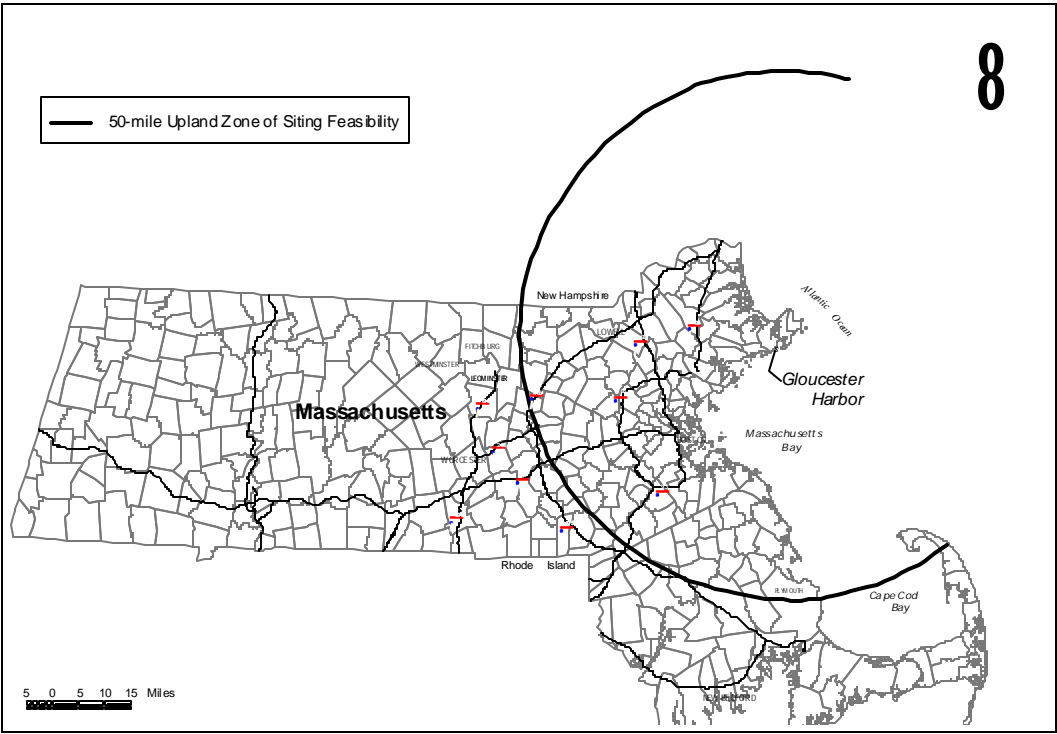


Figure 1-2: Upland Zone of Siting Feasibility

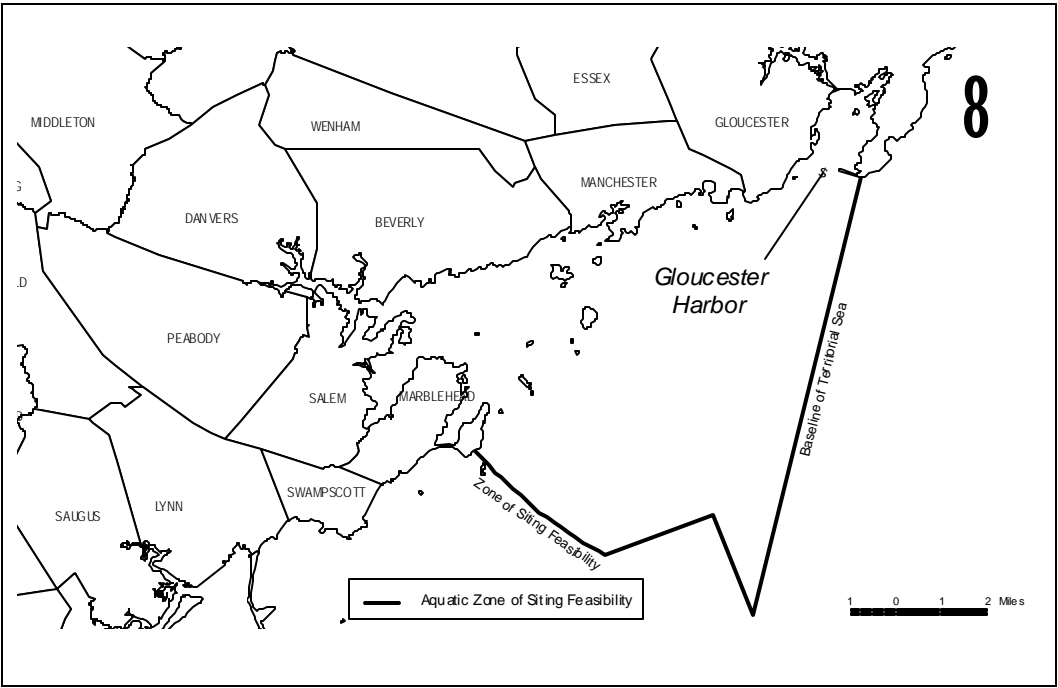


Figure 1-3: Aquatic Zone of Siting Feasibility

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Based on dredging records collected in the Massachusetts Navigation and Dredging Management Study that was completed by the USACE for the State of Massachusetts (USACE 1995), a total of 1,178,370 cubic yards (cy) of material has been dredged from Gloucester Harbor and the Annisquam River since 1932. Much of this volume was dredged prior to 1966, when the federal channel and anchorage areas were created. Additional dredging in the harbor since construction of the channel has included USACE maintenance dredging, projects performed by Massachusetts Department of Environmental Management (DEM) at various locations, city dredging and many private dredging operations.

The volume of sediment to be dredged from Gloucester Harbor over the next twenty years has been estimated through surveys conducted by the USACE (1996) and Maguire (1997). The dredged material volume estimates are needed to identify, plan and permit a disposal site(s) with sufficient long-term capacity to accommodate the needs for Gloucester Harbor.

The total volume of sediment to be dredged from Gloucester Harbor over the next 20 years is estimated at 514,440 cy. This figure includes a 20% contingency added to the surveyed volume to account for any uncertainty in the volumes provided by the marine users. The volumes presented in the sub-sections below are *without* the 20% contingency.

During the 1997 survey, all shoreline marina owners, municipalities, utilities, state and federal agencies were contacted via a mail-back questionnaire, with follow-up telephone calls to non-respondents. Marine users were asked to complete a questionnaire, denoting dredging footprints, volumes, and anticipated time schedule over the next 20 years. There were over fifty facilities (i.e. marinas, basins, channels) identified in the inventory, but not all facilities identified a need to dredge. The maintenance dredging of the Annisquam River is the largest project. The USACE has stated that the River is in need of maintenance dredging immediately. The Annisquam River is subject to heavy siltation and, on average, requires dredging every 8 years. Therefore, over the DMMP's 20-year planning period, an additional round of maintenance dredging has been included in the inventory. The inventory represents a planning estimate based upon *reported need*. Neither the inventory nor the DEIR establishes a list of projects that will or will not (by their absence from the inventory) be dredged.

Dredging of private marinas comprises a significant portion of the total material to be dredged from Gloucester (Figure 1-6). However, there are no maintenance or improvement dredging projects planned for the Gloucester Harbor federal channel and anchorage areas. In the original dredging inventory (1997), a proposed deepening of the federal channel from 20 feet to 26 feet was identified as a potential project involving 427,000 cy of dredging in the entrance channel, north channel and anchorage area. Further federal and city review has determined that this dredging is not necessary to support current harbor uses.

Given the assumptions presented above, it is estimated that approximately 276,000 cy of sediment to be dredged from Gloucester Harbor over the next 20 years would be UDM. For planning purposes, a 20% contingency has been added to the unsuitable volume to arrive at a volume of approximately 333,000 cy.

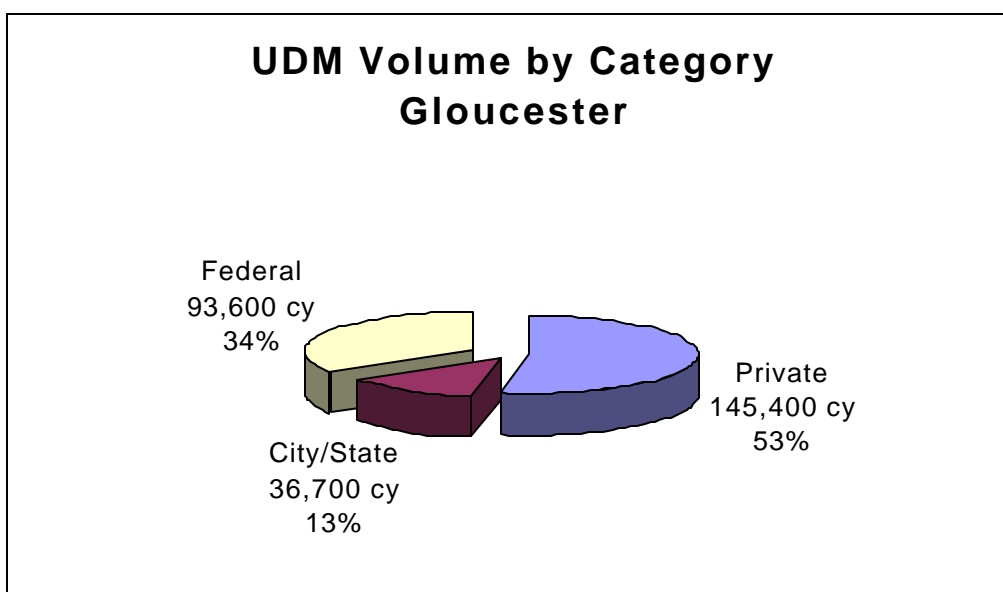


Figure 1-4: UDM Volume for Gloucester by Project Type
(does not include 20% contingency)

Table 1-1: Dredged material volumes (cy) for Gloucester Harbor for next 20 years

Inventory Total	Inventory Total with Contingency¹	Suitable Dredged Material² with Contingency	Unsuitable Dredged Material³ with Contingency
428,700	514,440	183,600	330,840

Notes:

¹ Contingency is 20%

² Suitable for disposal at MBDS

³ Not suitable for disposal at MBDS

Depending on the selection of disposal type (upland, aquatic) and location, there may be an additional volume of UDM. For example if a CAD cell footprint contains UDM, then the volume of material excavated for the creation of the CAD cells would also have to be managed as UDM. This scenario is discussed in greater detail in Section 8.0. To put the amount of UDM into perspective, 330,840 cy would cover approximately 205 acres to a thickness of one foot or cover the State Fish Pier to a depth of over sixty feet high.

1.2.4 Alternative Disposal Sites

1.2.4.1 Universe of Sites

Possible geographical locations to implement upland and aquatic disposal alternatives for UDM were investigated within the upland and aquatic ZSFs defined for the Gloucester Harbor DMMP. The logistical basis for each ZSF, described below, established a reasonable search area to develop the universe of potential disposal locations. A description of the development of the upland and aquatic universe of sites considered for the Gloucester Harbor DMMP follows.

Upland Universe

The Upland ZSF was established based upon a reasonable truck travel distance from Gloucester Harbor. A 50-mile ZSF (Figure 1-2) was established because it is the maximum distance a truck could travel to and from the dewatering site in a normal 8-hour working day. This included the time for loading and offloading at the dewatering site and disposal site, respectively. The Upland ZSF includes: most of eastern and southeastern Massachusetts, extending as far west in central Massachusetts as I-495; and most of the New Hampshire coastline to the north. Commercial landfills within these states were also investigated.

All possible upland disposal sites, 1,123 total, were identified by locating areas that could physically accommodate the UDM volume estimated in the DMMP Phase I inventory report. The purpose of this effort was to identify the largest possible universe of potential sites for analysis. The locations evaluated for this effort included all existing landfills (commercial and private), other areas identified by previous upland evaluations (MWRA, Boston Harbor, etc.). In addition, a statewide announcement for interest from landowners to accept the UDM was conducted to complete the comprehensive search for possible sites within the Upland ZSF. No detailed environmental or socioeconomic assessments were performed at this level.

Aquatic Universe

The Aquatic ZSF for Gloucester was defined based on reasonable transit distances from the dredging projects, local jurisdictional boundaries, and evaluation of restricted use areas such as marine sanctuaries. Based on the transit distance criteria, the Aquatic ZSF was defined by an arc extending 10 nautical miles (nm) (12 mi) from the entrance of Gloucester Harbor (Figure 1-3). Ten nm represented a reasonable distance to permit two round trips for a disposal barge towed at less than 5 knots within a 12-hour period. Sites considered further away would place an unreasonable operational cost on projects in the Port of Gloucester, particularly smaller dredging projects. In addition, the zone south of 10 nm has been extensively screened as a result of the Boston Harbor Navigation Improvement Project (NAE and Massport 1995). The Aquatic ZSF in Gloucester also was bounded southerly by the Nearfield Monitoring outfall. To the east the Aquatic ZSF was restricted by the limits of the baseline of the territorial sea based on state jurisdiction and the regulatory oversight of Section 404 CWA (40 CFR Part 230.2[b]). Finally, the Aquatic ZSF was limited to the south by the Massachusetts Water Resources Authority (MWRA) Deer

Island Wastewater Treatment Plant outfall difuser field and the “...reasonable distance to permit two round trips for a disposal barge towed at less than 5 knots within a 12-hour period” criteria of 10 nm.

Within the Aquatic ZSF, a total universe of 41 potential sites were identified. Potential sites were identified by defining areas with suitable bathymetric depressions and/or indications of a depositional area (i.e., containment areas not susceptible to storm wave currents) and existing navigational projects. Again, no detailed environmental or socioeconomic assessments were performed at this level.

1.2.4.2 Screening Process

The goal of the DMMP screening process was to identify the most appropriate sites for the disposal of UDM. There were no numerical thresholds that identified the “best” site; rather, the DMMP screening process was a relational comparison among potential sites and types by which a determination was made regarding which site is “better” than another. Therefore, the screening process was designed to assess a wide range of potential sites and then, through sequential analysis, continually narrow the list until only the most appropriate sites remained. The most appropriate sites were determined to be those that meet local, state and federal permitting standards, are consistent with Gloucester’s harbor planning objectives and are capable of being implemented at reasonable cost.

The DMMP screening process consisted of three primary steps:

- Initial screen for feasibility
- Application of site selection screening criteria
- Identification of preferred alternatives

Initial Screen for Feasibility

From the universe of potential sites, MCZM applied a screen for feasibility and eliminated sites that were clearly not suitable for disposal of dredged material. Sites were screened out because of the surrounding land uses (for upland sites), lack of protection from erosive bottom currents (aquatic sites), lack of access for the disposal type, or insufficient capacity as discussed in Section 4.0, alternative treatment technologies were evaluated for capabilities and logistical requirements of the process equipment, current and projected costs. Because new technologies are evolving, alternative treatment technologies are carried forward as an “open” category where practicable technologies will be assessed as they emerge. Sites that were not feasible disposal options were permanently eliminated from further consideration in this DEIR. Feasible sites were identified as Candidate Sites.

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Application of Screening Criteria

In preparation for site selection screening, MCZM developed site selection screening criteria based on the United States Army Corps of Engineers (USACE) Providence River Draft Environmental Impact Statement (USACE, 1998). The development of these criteria was coordinated with local, state, and federal agencies for concurrence. Site selection criteria were the standards by which the candidate sites were evaluated.

Site selection criteria were distinguished as either “exclusionary” or “discretionary”. Exclusionary criteria reflect a state or federal prohibition on dredged material disposal. For example, Stellwagen National Marine Sanctuary regulations prohibit dredged material disposal within the sanctuary. Had any candidate sites been situated within sanctuary boundaries (none were), this exclusionary criterion would have prohibited further evaluation of that site. Discretionary criteria are those that determine, when applied as a group, which sites are least or best suited for dredged material disposal. For example, the potential impacts to finfish spawning or nursery habitat were evaluated under discretionary criteria: the presence of such habitat in a candidate site would not automatically exclude the site from further consideration, but would identify that site as less desirable than one in which such habitat was absent. The application of various discretionary criteria was the main component of the screening process, and it was the process by which sites were compared, using the quantitative, site-specific information and regional characterizations to make a qualitative decision – which site was “best”.

To determine whether a given site included the exclusionary criteria and to determine how it compared to the discretionary criteria, site specific information was developed. Data sheets were developed for each candidate site, listing the environmental, social, political, and economic features of the site.

Candidate sites were screened under the exclusionary criteria. Those that failed were eliminated from further review. Sites that do not have features that are exclusionary became Potential Alternatives. Potential Alternatives were, then, reviewed using the discretionary criteria. Each Potential Alternative was assigned a relative ranking. Sites having significant limitations received low rankings; sites with fewer limitations received higher rankings.

The result of the screening process was a continuum of sites, from least to most appropriate for each disposal type evaluated. The least appropriate sites were categorized as reserve sites, and, as the name implies, were carried forward in reserve, but subjected to further analysis. More appropriate sites for dredged material disposal were categorized as Proposed Preferred Alternatives. Proposed preferred alternatives were presented to the City and federal agencies for comment. Results of the former, resulted in refining and the identification of the Preferred Alternatives Sites. The DMMP Disposal Site screening process is shown in Figure 1-5.

The Gloucester Harbor DMMP DEIR investigated the potential for the treatment of UDM with alternative treatment technologies to create material for beneficial uses, disposal in upland and aquatic locations. Additionally, the DMMP evaluated potential dewatering sites, critical to implementing alternative treatment technologies and upland disposal options. The following sections summarize the results of the alternative technology assessment, dewatering, upland and aquatic site screening.

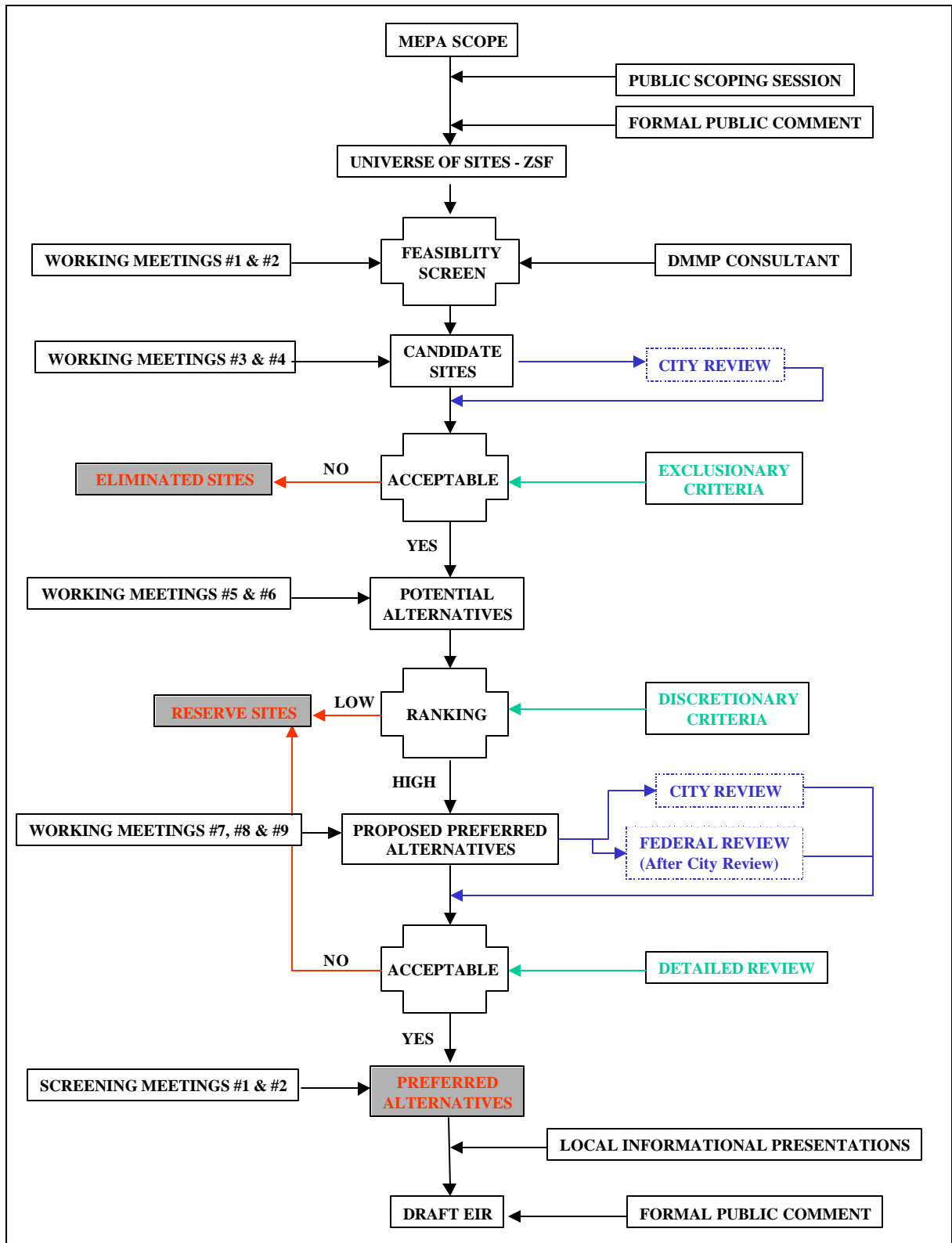


Figure 1-5: DMMP Disposal Site Screening Process

Alternative Technology Assessment

Alternative treatment technologies involve the treatment of UDM, using one or more processes, to allow for reuse of the sediment in a safe manner in the upland environment or for unconfined open water disposal.

There are four general types of treatment technologies, categorized based on their effect on the contaminants of concern within the sediment:

- *Destruction*; the removal of contaminants from the sediment via physical, chemical or biological agents;
- *Separation*; the process of removing contaminants from the sediment resulting in a concentrated residual of contaminated sediment of significantly smaller volume;
- *Reduction*; the process of reducing the amount of contaminated dredged material that requires treatment by screening sediments into various particle sizes; and
- *Immobilization*; the fixing of contaminants in the dredged material which keeps the contaminants from being released to the environment.

Fourteen (14) classes of treatment technologies were evaluated within the four broad categories listed above, involving a comprehensive survey of technology vendors. The results of the alternative treatment technology assessment indicate that, at this time, alternative treatment technologies do not appear to be a practicable solution to the management of UDM from Gloucester Harbor, primarily based upon cost effectiveness and market for materials.

However, alternative treatment technologies may prove viable for small projects, those that deal with unique and/or specific type(s) of contaminant(s), or as an element of a larger UDM management technique. Alternative treatment technologies are a rapidly growing and evolving field and it is very likely that as ongoing and future pilot and demonstration projects occur, the universe of technically viable, cost-competitive, and permissible alternatives may emerge.

For this reason, the DEIR carries forward all alternative treatment technologies as "potential future alternatives", and specifies the various general performance standards which alternative treatment technologies must meet to be considered as a practicable alternative (see Section 4.5 for a discussion of Beneficial Use Determination (BUD) process). This flexible approach will provide a baseline from which proponents of alternative treatment technologies can develop and present specific, detailed proposals, and will allow the state to focus its reviews on potentially practicable proposals. This approach is based on the Boston Harbor EIR/EIS. The DMMP will reevaluate, on a five year cycle, the feasibility of alternative treatment technologies for UDM in Gloucester Harbor and other harbors throughout the Commonwealth.

Dewatering Sites

All upland disposal/reuse and most alternative treatment technologies require a shore-front site of adequate size and availability to dewater dredged material prior to transport to an upland site. A total of thirty-eight (38) potential dewatering sites were identified along the shoreline from Manchester-by-the-Sea, north to Rockport. The universe of dewatering sites is shown in Figure 1-6.

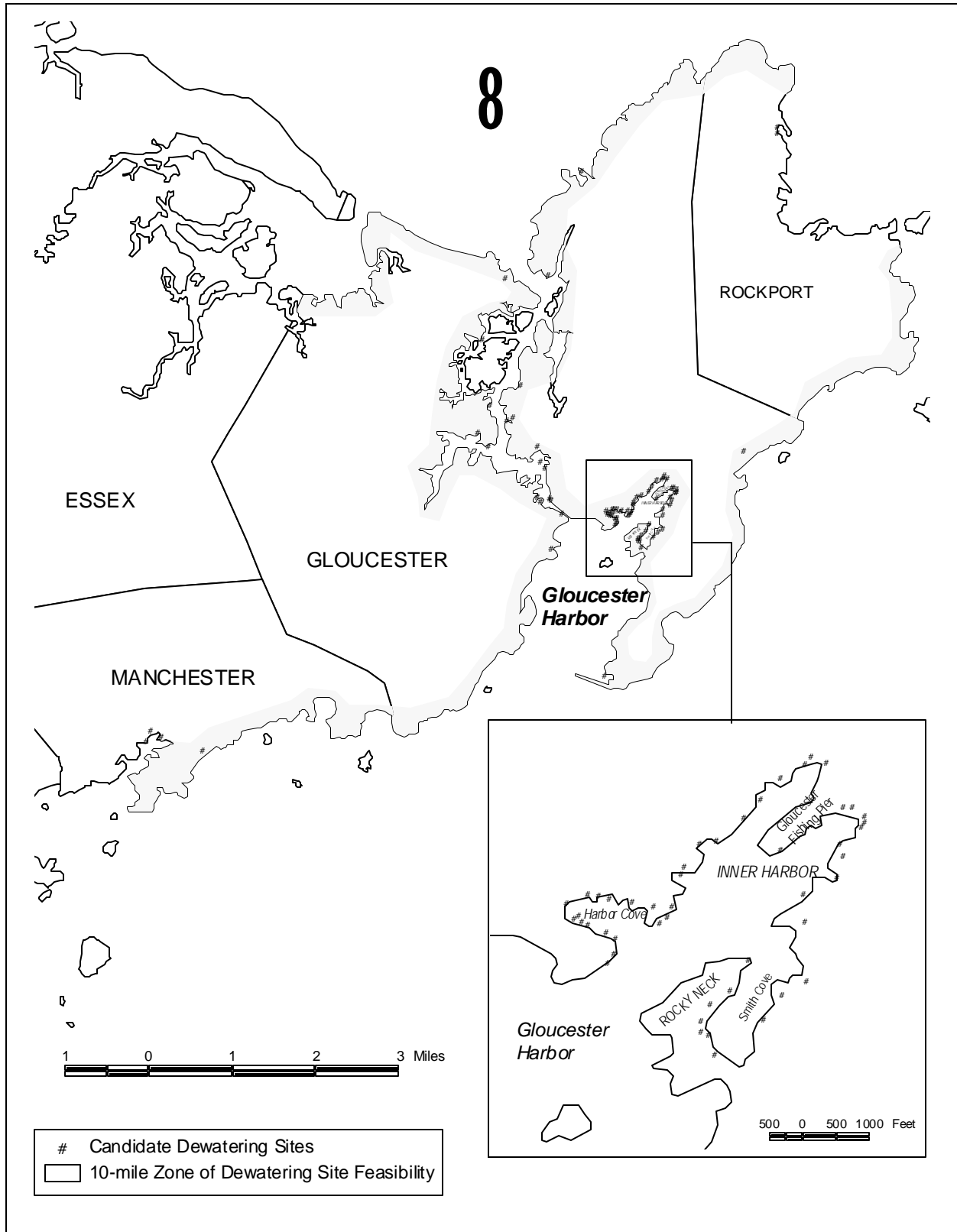


Figure 1-6: Candidate Dewatering Sites

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As with the aquatic and upland sites, the 38 candidate dewatering sites were subjected to a two tier process involving the initial screening for exclusionary site factors and a second tier screening for discretionary factors. The exclusionary factors only apply to the harbor side site requirements, all other criteria are discretionary. The minimum site area required for a DMMP dewatering site was estimated to be 3.2 acres. This estimate was based on practical application of DEP policies and guidance, and a minimum project size of 10,000 cy. None of the 38 sites were of sufficient size, nor were the sites practicable for dewatering dredged material.

Upland Sites

Upland reuse and disposal alternatives involve the placement of UDM on land. The site can potentially be an existing active or inactive landfill, or an undeveloped parcel of land. Dredged material can potentially be used as daily cover or grading/shaping material for landfills, provided the material meets the physical and chemical specifications for such use. Dredged material placed on an undeveloped parcel of land could be managed as a monofill (landfill for dredged material only), or could be used as fill or grading material that has a beneficial end use (e.g. ball fields, golf course), provided the physical and chemical properties of the dredged material permit such use. There are currently no regulations in Massachusetts, which specifically apply to the disposal of dredged material in the upland non-landfill environment. Use at active and inactive landfills is based on the requirements and procedures described in DEP Policies COMM-94-037, COMM-97-001 and the July 17, 2000, "Guidelines for Determining Closure Activities at Inactive Unlined Landfill Sites". Monofills for dredged sediment are currently regulated under the Commonwealth's Solid Waste Management Regulations at 310 CMR 16.00 and 19.000).

The total universe of upland sites was subjected to an initial feasibility screen that evaluated the site for a minimum capacity 10,000 cubic yards, and its compliance with setback requirements specified in the Solid Waste Regulations. These factors dictated a minimum site size of twenty-five (25) acres. A total of 270 sites in the upland universe were smaller than 25 acres and were eliminated, leaving a total of 853 candidate disposal sites from an initial universe of 1,123 sites.

These remaining 853 sites were then subjected to an exclusionary screening, based on factors that would effectively prohibit disposal of UDM based on state or federal laws, including the presence of: rare or endangered species; historic or archaeological sites or districts; and drinking water supplies. A total of eleven (11) upland sites within the Gloucester upland ZSF passed the exclusionary screening process. One potential site just outside the ZSF boundary was also carried forward. These sites are illustrated on Figure 1-7.

Additional discretionary screening factors were applied to the remaining 11 sites, including: groundwater and surface water quality; wetlands; accessibility; area of impact; duration of potential adverse impacts; habitat types; terrain; floodplains; agricultural use; ability to contain; potential for odor/dust/noise impacts; consistency with local, regional and state plans; ability to obtain permits; and cost. After the application of the discretionary screening criteria, none of the twelve (12) sites were considered potential preferred alternatives.

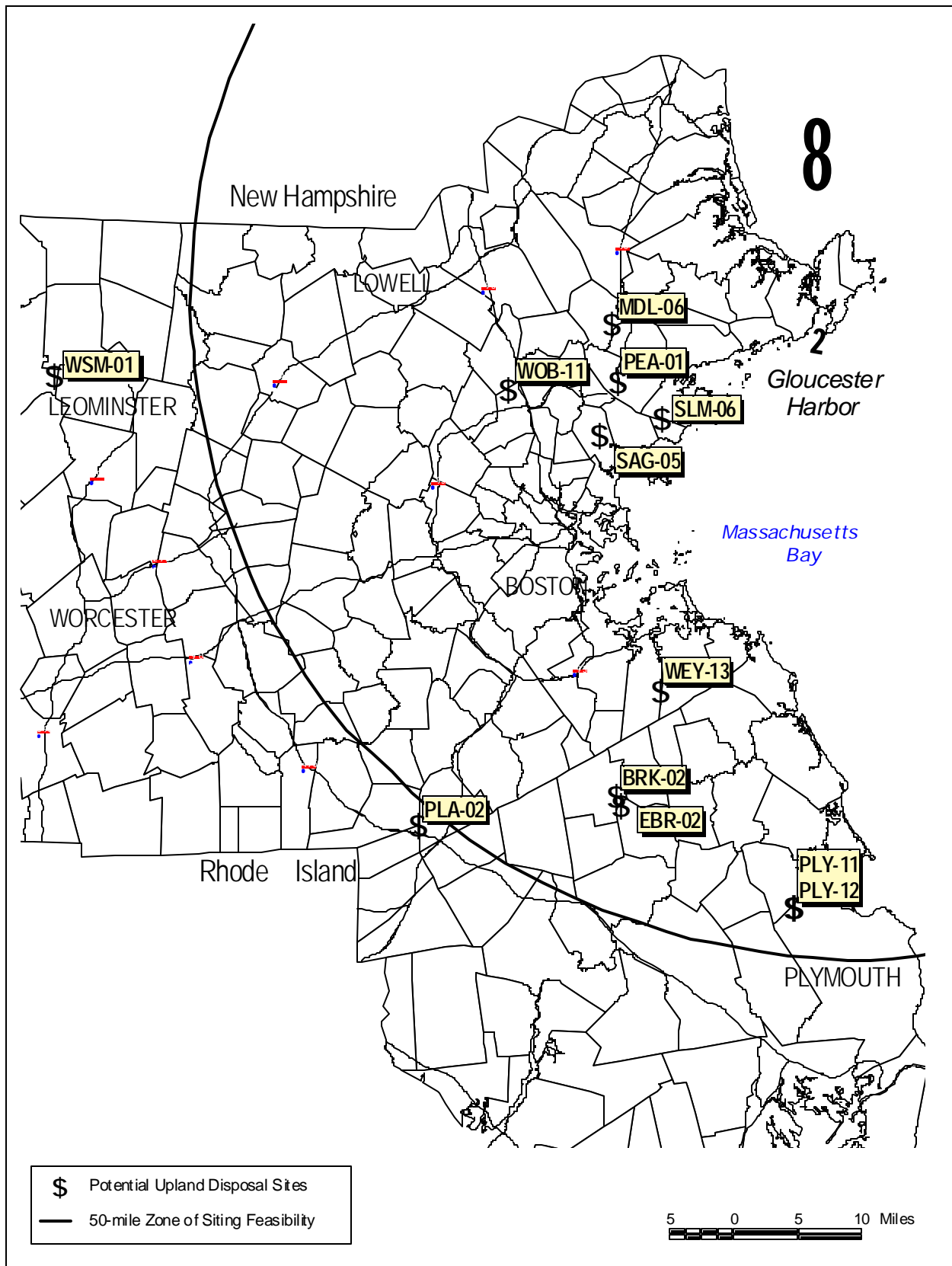


Figure 1-7: Potential Upland Disposal Sites

Aquatic Sites

Two general types of aquatic disposal sites were evaluated for the Gloucester Harbor DMMP: confined aquatic disposal (CAD) and confined disposal facilities (CDF). A CAD is an underwater site where UDM is deposited and then covered (capped) with a layer of clean material to isolate UDM from the environment. A CDF is an aquatic site that is typically an extension of land with constructed walls on the three remaining sides. There are three general types of CADs evaluated in this DEIR:

- Confined aquatic disposal/over dredge (CAD/OD) site: an existing navigation channel is over dredged to a depth sufficient to accommodate both a volume of UDM and a cap of clean material without interfering with navigation (Figure 1-8).
- Open water CAD site: CAD cell is constructed on the ocean bottom, or UDM is deposited in an existing depression in the ocean floor (Figure 1-9).
- Adjacent to channel (ATC) site: a CAD cell constructed in an area immediately adjacent to a navigation channel, where the ocean bottom may be previously disturbed or degraded due to the proximity of the navigation channel and channel dredging activities.
- Confined disposal facility (CDF): a CDF site is constructed by building a wall seaward of an existing land feature and backfilling behind the confinement wall with dredged material. Typical end-use of such facilities include port expansion and open space land creation (Figure 1-10).
- Tidal Habitat (TH): a TH site is a CDF that allows tidal influx, via culverts, over a contained area of dredged material. TH sites can be designed to create mudflat or coastal wetland (Figure 1-11).

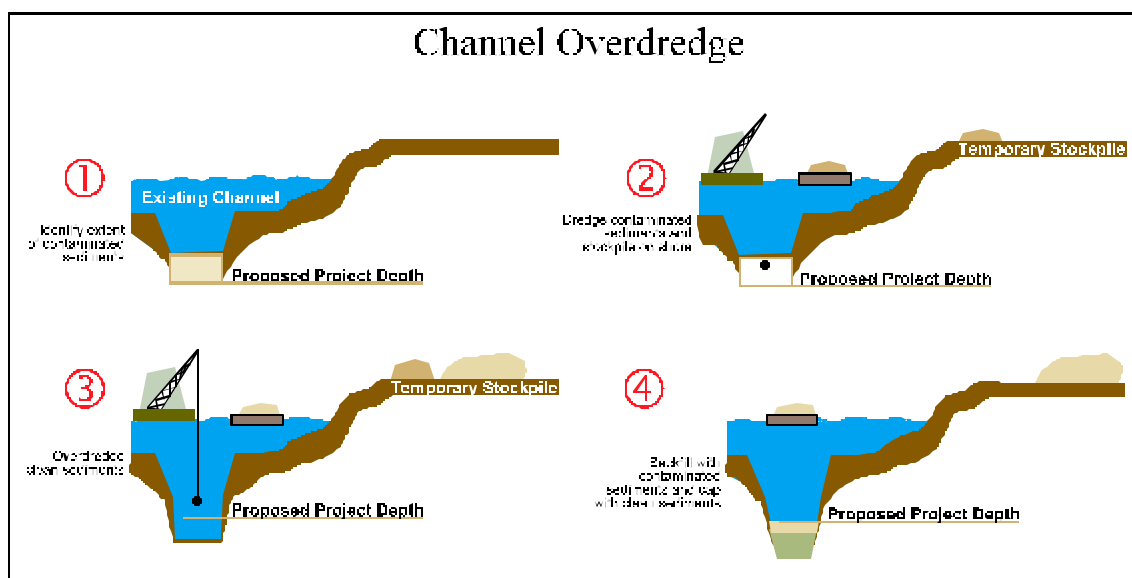


Figure 1-8: Schematic of Channel Overdredge (OD) method

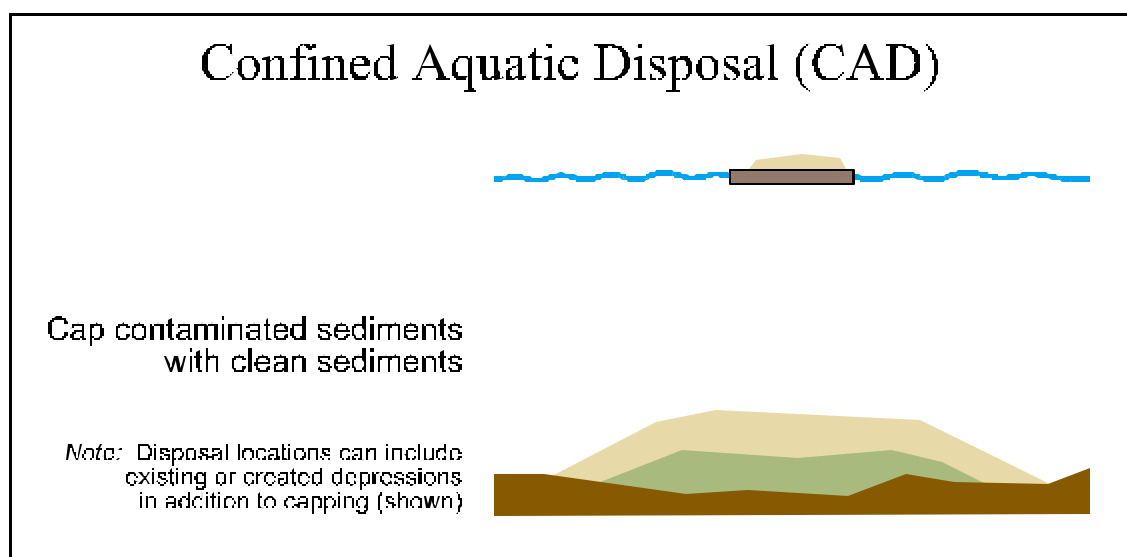


Figure 1-9: Schematic of Confined Aquatic Disposal (CAD) method

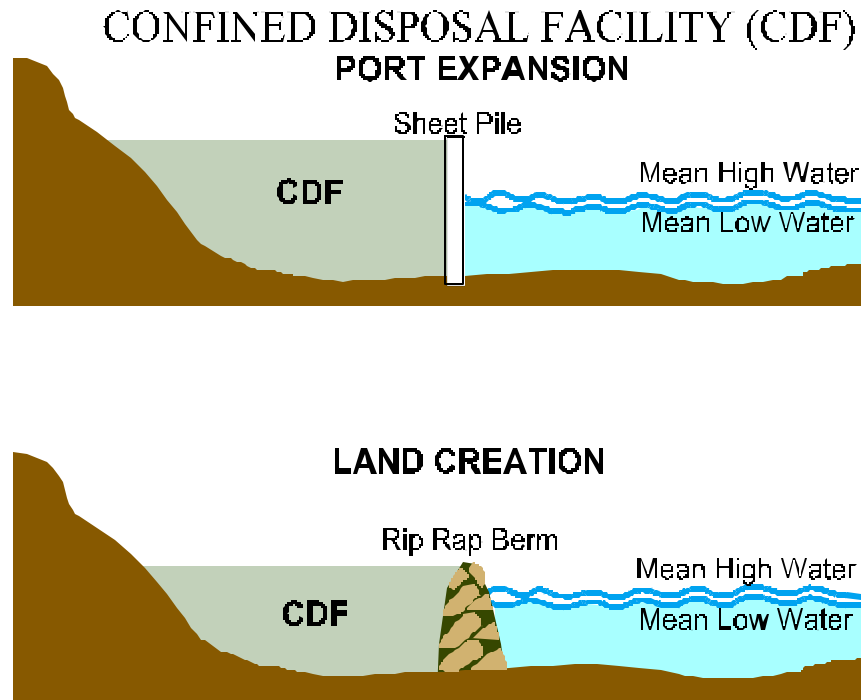


Figure 1-10: Schematic of the Confined Disposal Facility (CDF) method

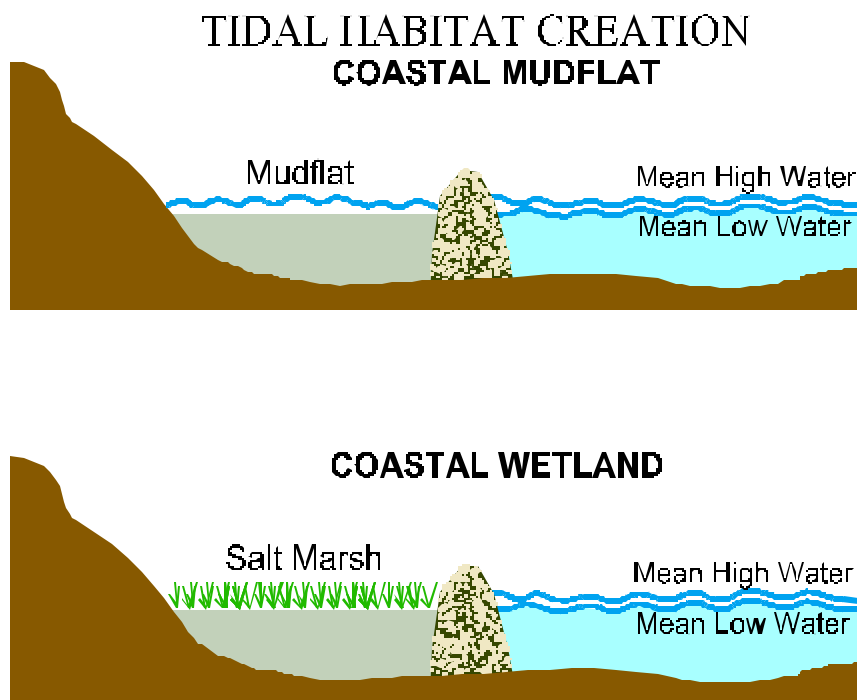


Figure 1-11: Schematic of the Tidal Habitat (TH) creation method.

A multi-step siting process was used to identify and screen aquatic disposal sites for UDM from Gloucester Harbor. The first stage of the siting process was to define the range of disposal options by delineating a ZSF for Gloucester Harbor (Figure 1-12). The technical description and rationale for delineation of the ZSF is fully described in Section 4.8.3.1.

A universe of disposal sites was identified within the ZSF, based primarily on physical characteristics and the potential ability to contain UDM. Additional sites were added at the suggestions of the City Harbor Planning and Dredging Committee. There were a total of 36 sites at this stage of the screening process (Figure 1-13).

Next, the containment potential and capacity of these sites were assessed in detail, which resulted in a reduction of candidate sites from 36 sites to 25 possible sites (Figure 1-13). Sites that were: 1) located in erosional or reworking zones, 2) in areas subject to erosive forces limiting containment potential, or 3) in regions that provided limited capacity were eliminated from further consideration.

The 25 candidate sites were then evaluated based on a series of discretionary criteria. They include considerations of fisheries, shellfish habitat, coastal wetlands, navigation, and others as described in Section 4.8.2. These factors, when applied to the sites, do not necessarily result in sites that are prohibited from receiving UDM. Rather, they help identify which sites are more conducive to accepting UDM than others. Application of the discretionary criteria to the candidate sites resulted in a “short-list” of thirteen potential disposal sites (Figure 1-14).

The thirteen potential disposal sites underwent a more detailed review using the aforementioned discretionary factors. In particular, water depth, presence/absence of submerged aquatic vegetation, proximity to inter- and subtidal resources, and ability to obtain a permit, were the key discretionary criteria that resulted in some sites being placed in reserve status. This resulted in a narrowing of thirteen potential disposal sites to six proposed preferred disposal sites (Figure 1-15).

The six proposed preferred disposal sites underwent additional detailed study, using the discretionary criteria. These sites, and the process that resulted in the selection of these sites, were presented to the City and federal regulatory agencies for review and discussion. See Section 1.2.6 for discussion of the identification of the preferred alternative

Summary of Disposal Alternatives Evaluated

Alternative treatment technologies hold promise for future applications, but do not currently appear capable of accommodating large-scale volumes of dredged material. While the conceptual benefits of alternative treatment technologies are significant (using dredged material as a beneficial resource, not disposing of as waste), the inability of alternative treatment technologies to overcome the practical issues of cost, production rates, side-stream emissions and end-market uses limits the current applicability for this alternative. The potential application of solidification/stabilization technology for dredged material is discussed fully in Section 4.5.

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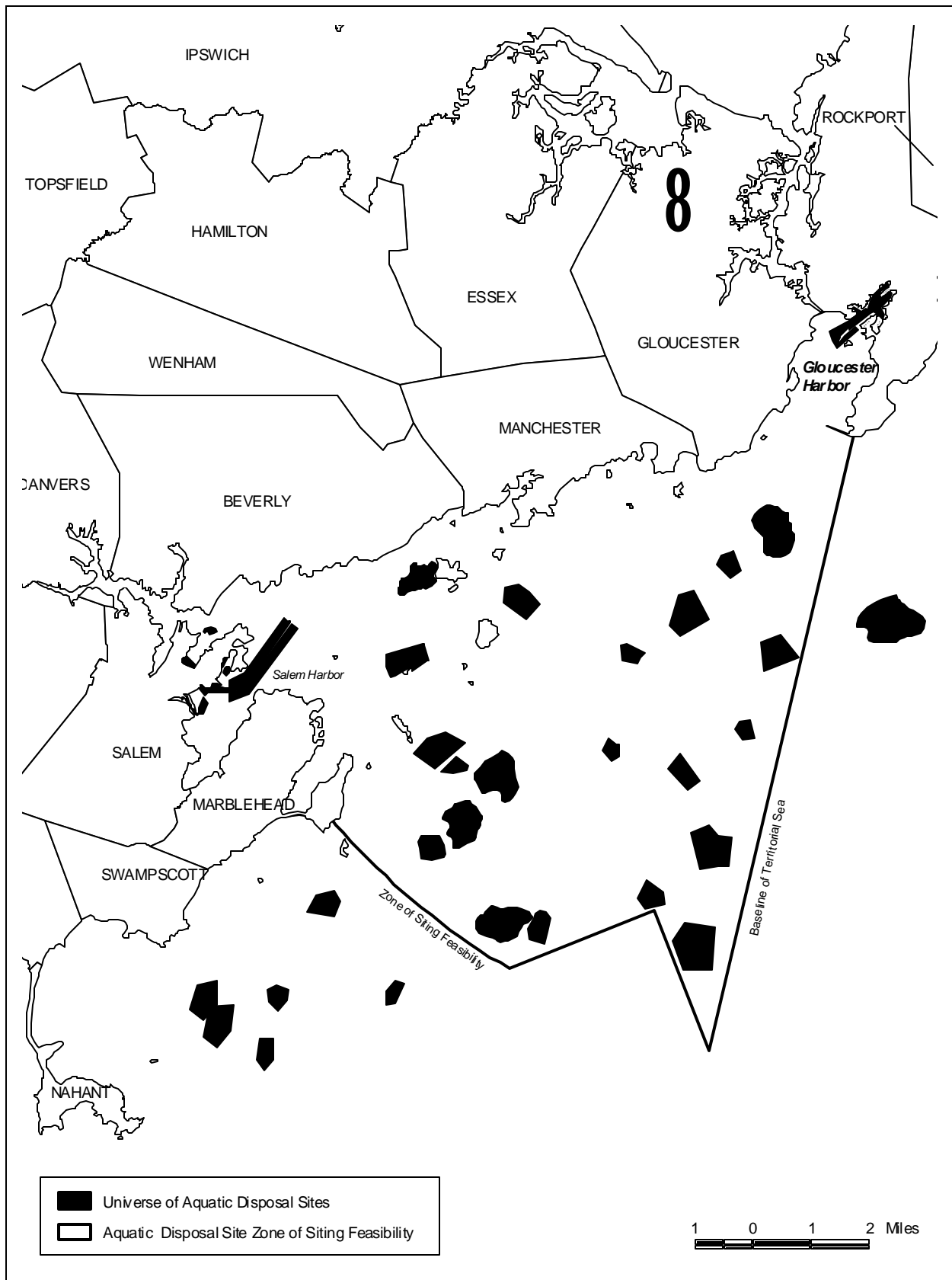


Figure 1-12: Gloucester Universe of Aquatic Disposal Sites

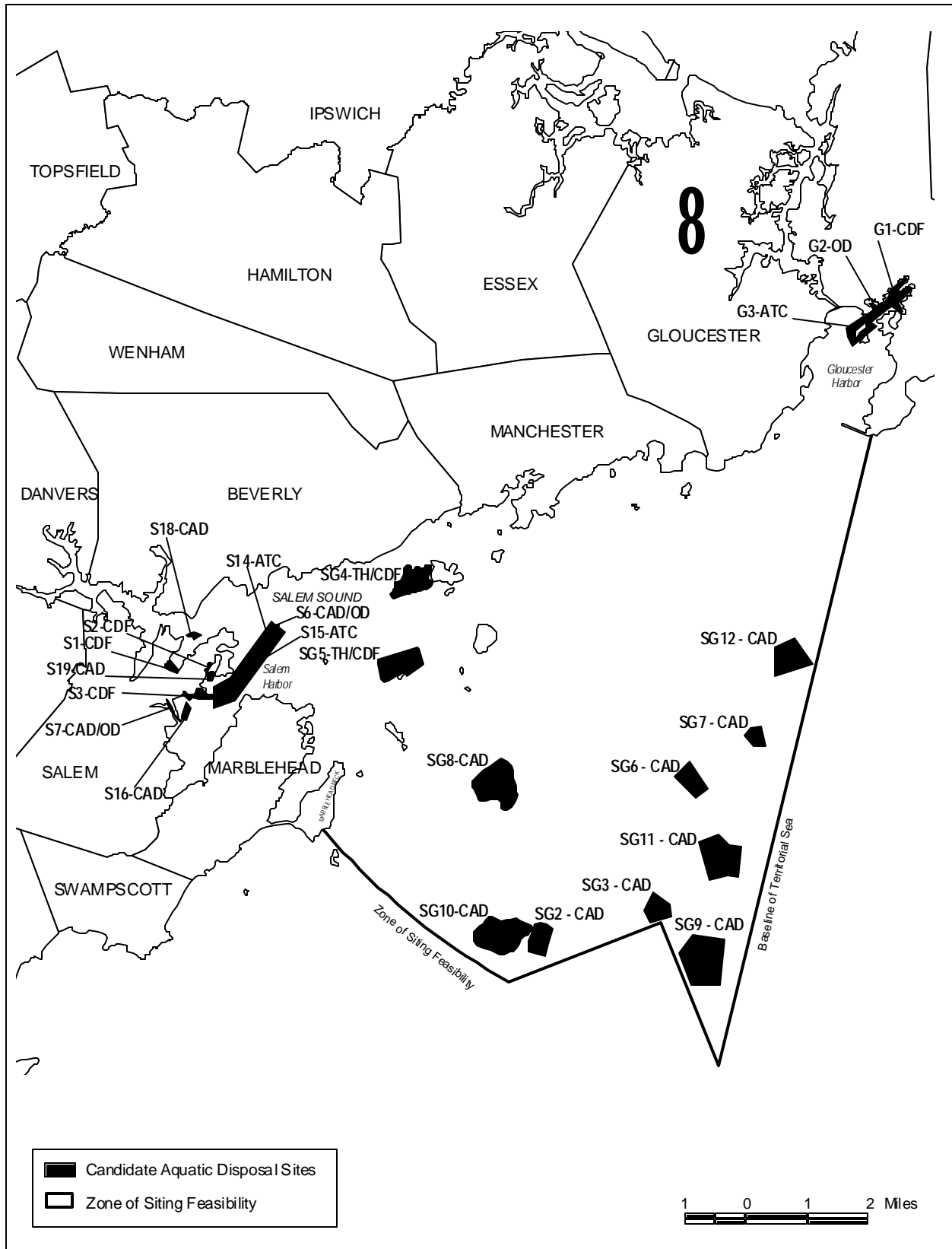


Figure 1-13: Gloucester Candidate Aquatic Disposal Sites

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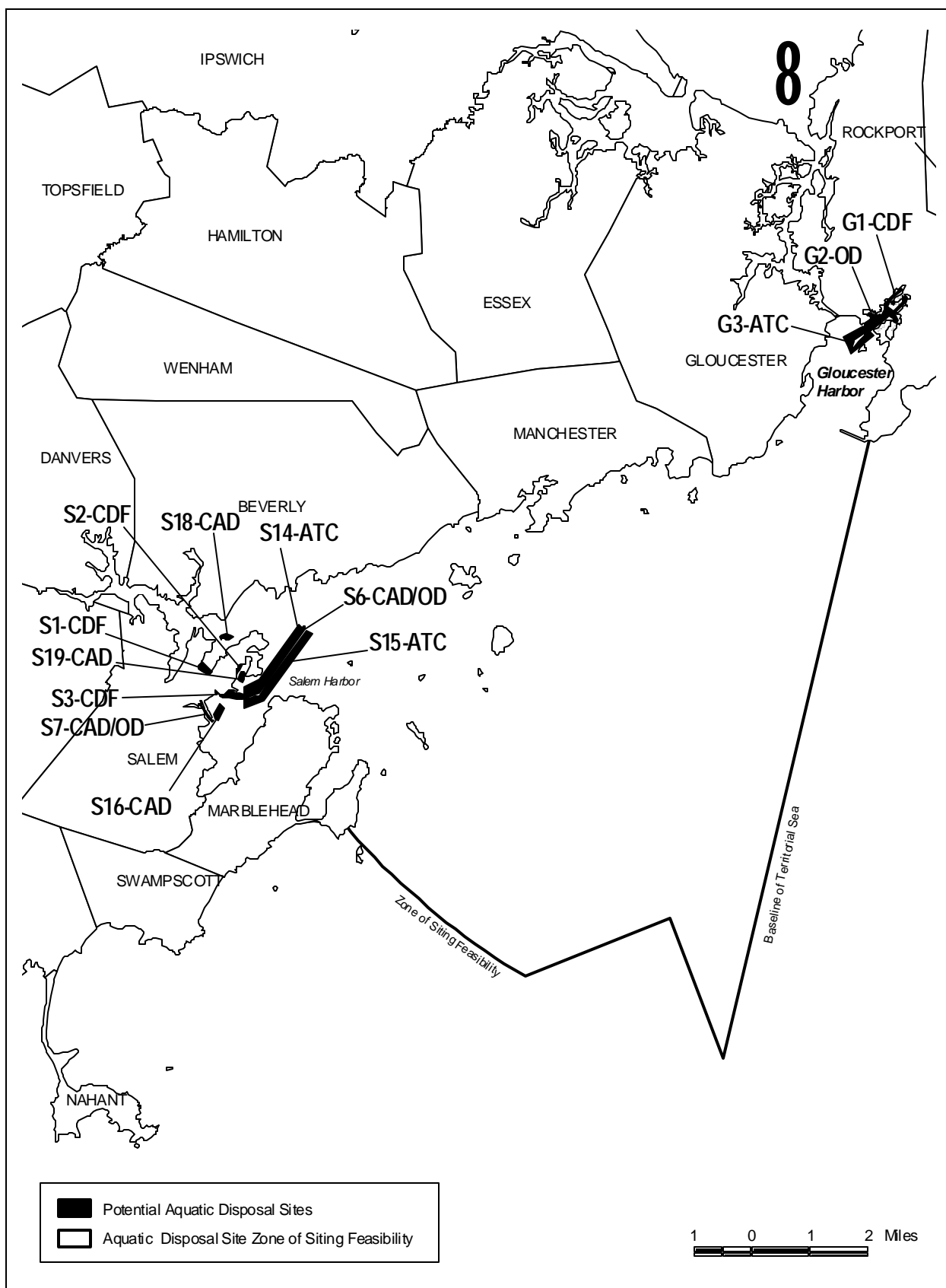


Figure 1-14: Potential Disposal Sites

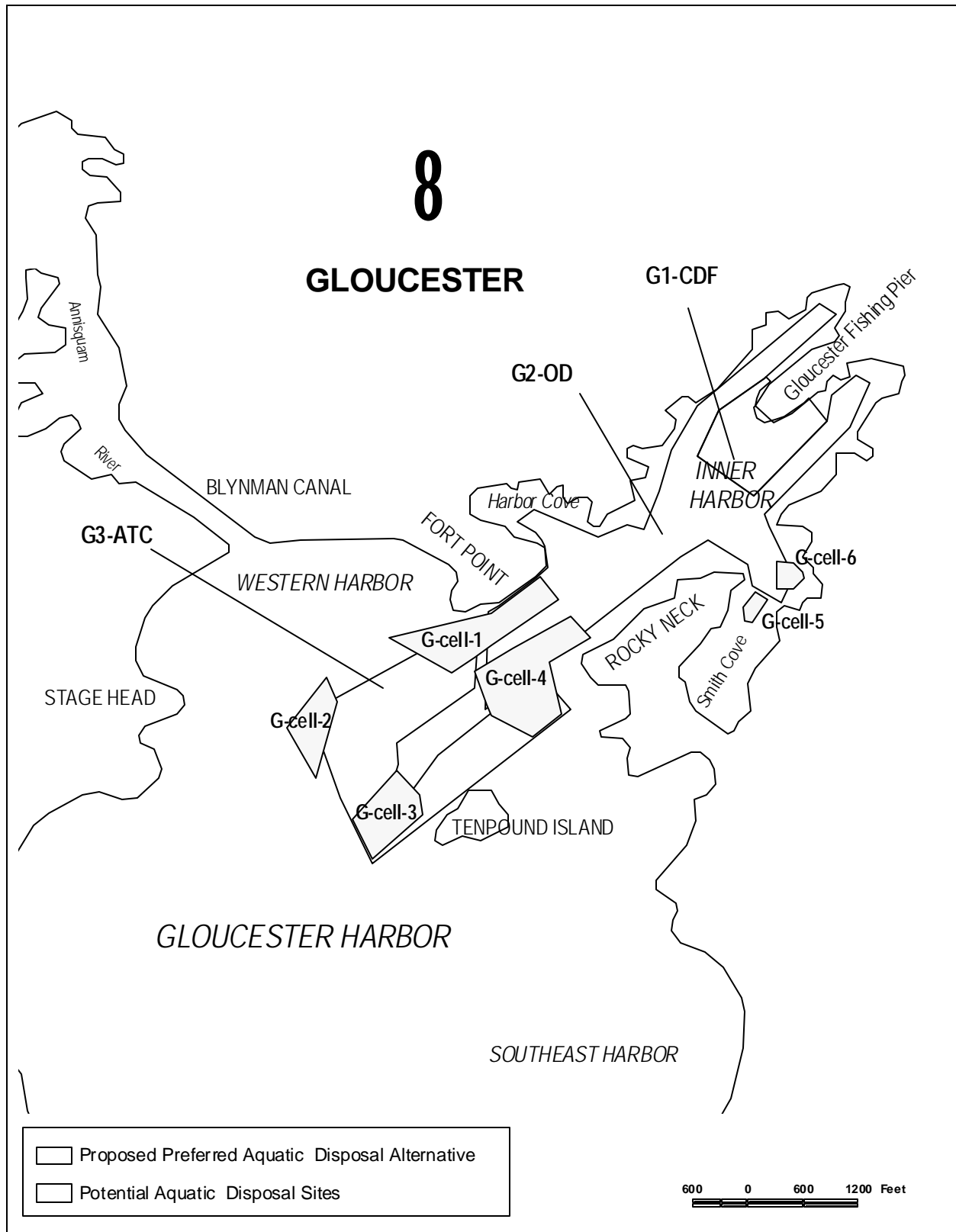


Figure 1-15: Proposed Preferred Aquatic Disposal Sites

Upland disposal and beneficial reuse alternatives did not become preferred alternatives due to limited capacity, practicability and/or cost. While two upland sites have significant capacity, the practicability of site use is low and the cost is high. The limited capacity of the remaining sites render them impracticable as alternatives.

Aquatic disposal sites fell into three general categories: deep-water sites, Salem Harbor sites, and Gloucester Harbor sites. Deep-water sites were screened out because they were subject to erosional bottom currents or because of the likelihood of significant impacts to groundfish resources and fisheries. Salem Harbor sites were screened out for lack of practicability (limited capacity for non-Salem material; site use for Gloucester material conflicts with the Salem Harbor Plan, which establishes a prohibition against use of Salem sites for non-Salem material). Gloucester Harbor sites were carried forward through the screening because they are practicable (close to the harbor; in the general area of existing contaminated sediments), cost-effective, and have associated environmental impacts that are temporary and can be mitigated.

1.2.5 Identification of the Preferred Alternative

The relative merits of each proposed preferred disposal site for accepting UDM were evaluated by comparing existing information and site-specific field data. The proposed preferred alternatives were presented to the Gloucester Harbor Dredging Subcommittee at a meeting held in Gloucester in January, 2000. This resulted in the selection of a preferred aquatic disposal alternative (Figure 1-16). G-Cell-5 and G-Cell-6 were relegated to reserve status for several reasons including: lack of capacity, possible hindrance to navigation in narrow straits to Smith Cove, and potential impacts to intertidal resources in Smith Cove. The remaining 4 areas (G-Cells 1 through 4) comprise the preferred alternative. All four of these areas are needed to accommodate the anticipated dredging volume of 330,000 cy over the next 20 years.

Potential Environmental Impacts and Mitigation Measures

This section summarizes the potential environmental impacts and proposed mitigation measures for each of the Preferred Alternative aquatic disposal sites for the Gloucester Harbor DMMP. A detailed analysis of project impacts is included in Section 6.0 of this document. Sections 8.0, 9.0 and 10.0 include a discussion of construction/management issues and potential mitigation measures for the Preferred Alternatives. The results of the analysis conducted to assess environmental impacts and potential mitigation measures for the preferred alternatives are summarized in Table 1-2. In Table 1-2, specific environmental features are contrasted with the “no action alternative”, the alternative of not undertaking the project, to provide a baseline for comparison. The no action alternative is described in Section 4.2. Both impacts and mitigation measures are grouped by screening criteria for the no action alternative and preferred alternative disposal sites.

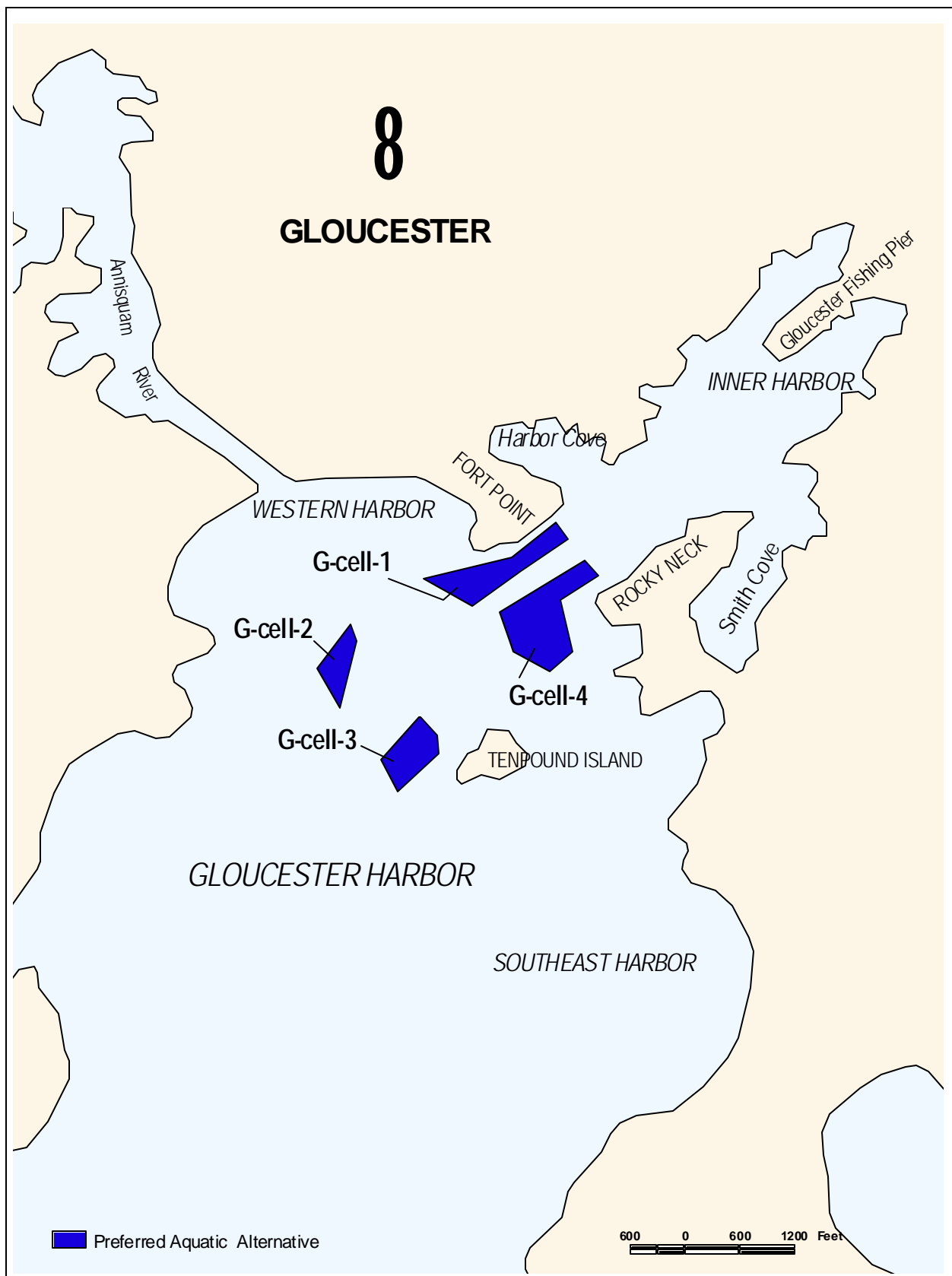


Figure 1-16: The Preferred Disposal Sites

SECTION 1.0 - EXECUTIVE SUMMARY

Table 1-2: Potential environmental impacts and mitigation measures for the aquatic disposal preferred alternative: G-Cell-1, G-Cell-2, G-Cell-3 and G-Cell-4

AQUATIC SITES: G-Cell-1, G-Cell-2, G-Cell-3 and G-Cell-4		
Environmental Feature	No Action Alternative	Impact/Mitigation Measures
<i>Sediments</i>	No Impact	Impact: Change in substrate conditions, from soft silt to sand. Mitigation: Recess final cap material elevation relative to existing elevation in order to encourage active sedimentation over cap if necessary.
<i>Sediment Transport</i>	No Impact	Impact: no permanent impact Mitigation: none required
<i>Water Quality</i>	No Impact	Impact: Short term localized, degradation (e.g. increased turbidity) due to dredged material disposal; Monitoring to ensure compliance with water quality standards Mitigation: Disposal only during favorable tidal conditions to minimize impacts.
<i>Benthos</i>	No Impact	Impact: Mortality of some benthic organisms. Change in substrate conditions will favor organisms that prefer sand. Mitigation: Recess final cap material elevation relative to existing elevation in order to encourage active natural sedimentation over cap, prompting natural recolonization of benthos, if necessary.
<i>Shellfish</i>	No Impact	Impact: No impact to known shellfish beds (field verification required for G-Cell-4). Mitigation: Avoid disposal under high turbidity conditions (e.g. unfavorable weather/tidal conditions)
<i>Lobsters</i>	No Impact	Impact: No impact to sedentary (early benthic phase) life stages. Juveniles and adults will survive by moving from disturbed area. Some mortality will occur during dredging and disposal. Mitigation: Per consultation with DMF and NMFS
<i>Submerged Aquatic Vegetation</i>	No Impact	Impact: No resources within disposal site Mitigation: None Required
<i>Wetlands</i>	No Impact	Impact: No impact to Federally designated wetlands. Impact to State-designated Land Under Ocean from cell construction and disposal activities Mitigation: Allow natural sedimentation of cap. Natural benthic recolonization expected.

Table 1-2: Potential environmental impacts and mitigation measures for the aquatic disposal preferred alternative: G-Cell-1, G-Cell-2, G-Cell-3 and G-Cell-4 (continued)

AQUATIC SITES: G-Cell-1, G-Cell-2, G-Cell-3 and G-Cell-4 (continued)		
Environmental Feature	No Action Alternative	Impact/Mitigation Measures
<i>Finfish</i>	No Impact	Impact: Seafloor habitat will be disturbed. Potential impact to early life history fishes. Mitigation: Time disposal activities to avoid peak spawning periods and other sensitive life stages.
<i>Wildlife</i>	No Impact	Impact: No impact to shorebird, waterfowl or seabird breeding habitat. No impact to shorebird foraging habitat. Minimal impact to waterfowl, and seabird foraging habitat. No impact to marine mammal and sea turtle breeding or foraging habitat. Mitigation: None Required
<i>Endangered Species</i>	No Impact	Impact: No impact to known endangered species habitat at disposal site Mitigation: None required
<i>Lobstering</i>	No Impact	Impact: Lobster habitat will be disturbed at the disposal sites. Lobstering will be disallowed at the sites during disposal. Mitigation: Per consultation with DMF and NMFS.
<i>Recreational Fishing</i>	No Impact	Impact: Fishing in an near disposal cells will be affected during dredging and disposal due to fish movement outside the disturbed area. Mitigation: Construction activities to occur outside of peak fishing season.
<i>Navigation and Shipping</i>	Lack of disposal site may limit dredging activity which will lead to shallower water depths, affecting safe navigation and reducing moorings	Impact: Potential interference with commercial fishing industry shipping. Mitigation: Timing of disposal and cell construction activities to avoid ship movements.
<i>Land Use</i>	Lack of disposal site may lead to loss of water-dependent uses, changing land use patterns, impose limitations on future economic diversification based on commercial shipping	Impact: No direct impacts; Positive indirect impacts resulting from maintenance of existing land use patterns and maintenance of options for future economic growth based on commercial shipping. Mitigation: None required
<i>Consistency with Gloucester Harbor Plan</i>	Lack of disposal site is not consistent with Harbor Plan	Impact: Positive; disposal site is consistent with Harbor Plan objectives. Mitigation: None required

Table 1-2: Potential environmental impacts and mitigation measures for the aquatic disposal preferred alternative: G-Cell-1, G-Cell-2, G-Cell-3 and G-Cell-4 (continued)

AQUATIC SITES: G-Cell-1, G-Cell-2, G-Cell-3 and G-Cell-4 (continued)		
Environmental Feature	No Action Alternative	Impact/Mitigation Measures
<i>Air Quality/Noise/Odor</i>	No Impact	Impact: AQ - temporary diesel emissions; potential volatilization of organic compounds; Noise - temporary increase in disposal site noise levels; some increase expected at nearby land side receptors; Odor- potential odor impact from hydrogen sulfide emanating from dredged material temporarily stockpiled on barges. Mitigation: AQ - use of properly operating equipment and participation in DEP's Voluntary Diesel Retrofit Program (VDRP), Noise- use of properly operating and mufflered equipment, operation during daylight hours; Odor- use lime to control objectionable odors emanating from dredged materials
<i>Historic/Archaeological Resources</i>	No Impact	Impact: Potential historic and archaeological resources to be further investigated; impacts to potential previously undiscovered historic shipwrecks unlikely due to previous dredging activities. Mitigation: Possible discovery, recovery and/or recordation
<i>Recreation</i>	No Impact	Impact: Recreational boaters temporarily diverted from area during cell construction and disposal operations, cell construction and disposal activities may drive fish from nearby recreational fishing areas Mitigation: None required

Disposal Costs

In the DEIR, disposal costs were calculated for each of the preferred alternative disposal sites. The average unit cost of disposal was calculated to range between \$42.92 to \$45.64 per cy (total cost ÷ UDM disposal volume) of UDM. A range of values was calculated to take into account the potential for the footprints of G-Cell-1 and G-Cell-4 containing UDM. The cell construction unit costs calculated do not include the cost of dredging and transport of UDM from individual facilities. Table 1-3 illustrates the UDM disposal volumes and costs of each preferred alternative disposal site.

Table 1-3: Disposal capacities and costs of preferred disposal alternative sites

PREFERRED ALTERNATIVE (Site Name)	UDM DISPOSAL VOLUME (cy)	CELL CONSTRUCTION COSTS	
		UNIT COST (\$/cy)	TOTAL COST (\$ million)
<i>G-Cell -1</i>	126,190	\$39.13 - \$41.95¹	\$4.9 - \$5.3
<i>G-Cell -2</i>	22,380	\$60.49	\$1.4
<i>G-Cell -3</i>	22,575	\$70.33	\$1.6
<i>G-Cell -4</i>	159,695	\$39.17 - \$42.81¹	\$6.3 - \$6.8
<i>Total</i>	330,840	- - -	\$14.2 - \$15.1
<i>Average</i>	- - -	\$42.92 - \$45.64	- - -

Notes:

1. Range of values calculated for G-Cell-1 and G-Cell-4 account for potential UDM within disposal footprints. Lower unit cost assumes 0% UDM in cell footprint and higher value assumes 100% UDM in cell footprint.

To illustrate the relative costs of disposal types considered in the DMMP, estimated costs were calculated to dispose of 1,000 cy of UDM for Gloucester Harbor for comparison purposes (Table 1-4). The range of unit costs calculated for the preferred alternative cells are less than the range of values calculated for upland disposal and reuse of between \$60 cy for grading/shaping material to \$117 for a new landfill to dispose of UDM (see Section 4.7). The aquatic and upland disposal and reuse unit costs are directly comparable, in that both values do not include dredging and are based upon disposal of volumes of UDM identified in areas of potential dredging identified in the inventory.

Table 1-4: Disposal Cost Comparison example for 1,000 cy of UDM

DISPOSAL TYPE	UNIT COST¹ (\$/cy)	ESTIMATED COST (\$/1,000 cy)
<i>Aquatic Disposal²</i>	\$42.00	\$42,000
<i>Upland Disposal and Reuse - Shaping/Grading³</i>	\$60.00	\$60,000
<i>Upland Disposal and Reuse - Monofill³</i>	\$117.00	\$117,000
<i>Alternative Treatment Technology⁴</i>	\$99.00	\$99,000

Notes:

1. UDM disposal costs only; does not include cost of dredging
2. Upper range of unit cost for G-Cell-4 (0-5 year planning horizon) used for aquatic disposal example.
3. Assumes reuse as grading/shaping material. Please note upland disposal of UDM may require amendment of between 2 to 3 parts soil to 1 part of UDM.
4. Alternative treatment technology unit cost is for Solidification/Stabilization, the only technology demonstrating potential feasibility for Gloucester Harbor UDM (see Section 4.5.5)

CAD Cell Sequencing

In order to contrast the planning horizon UDM volumes requiring disposal with the preferred alternative disposal sites, cell capacity calculations were conducted to determine the extent of the predicted disposal volumes occupying the preferred alternative disposal sites (see Section 8.0 for full description of conceptual engineering conducted). By contrasting the ability of each disposal cell to accommodate planning horizon UDM volumes, the following potential phasing sequence was developed:

- ***G-Cell-4*** - Five Year Planning Horizon
- ***G-Cell-1*** - Ten Year Planning Horizon
- ***G-Cell-3*** - Fifteen Year Planning Horizon
- ***G-Cell-2*** - Twenty Year Planning Horizon

Currently, it is envisioned that each of the four disposal cells would be open for one dredging season within a five year window. The dredging window, as specified by DMF and DEP, is usually from late fall to spring and is designed to avoid the sensitive life stages of important fish and shellfish species. Therefore, excavation of the cells, placement of the UDM within the cells, and capping of the cells would likely occur within a period of less than six (6) months.

The five year duration of each phase is intended to provide ample notice of availability of a disposal facility, providing facilities an opportunity to secure the necessary permits and funding to conduct dredging projects. This planned opening of a disposal facility on a regular basis should also provide opportunities for coordinating various harbor projects.

The results of the conceptual engineering exercise and the disposal cell phasing were presented to the Dredging Subcommittee. Based on the Subcommittee's review and discussion, the City's preference for use of the preferred alternative disposal cells is as follows:

- ***G-Cell-4*** - Five Year Planning Horizon
- ***G-Cell-2*** - Ten Year Planning Horizon
- ***G-Cell-3*** - Fifteen Year Planning Horizon
- ***G-Cell-1*** - Twenty Year Planning Horizon

The first scenario described above is based upon matching the projected volumes of UDM identified in the dredging inventory with the estimated cell capacities, based upon the current configurations. Both the DMMP's and the City's preference is to use G-Cell-4 to accommodate the UDM volume identified for the 5 year planning horizon, the planning horizon projection with the greatest level of confidence. As the DMMP moves into the 10, 15 and 20 year planning horizons, the level of confidence in the projections are less certain. The City's preferred approach will determine the design and location of the CAD cells as additional site specific data is developed and out-year disposal volumes are determined.

In the FEIR, detailed site specific data will be collected for the G-Cell sites. These data will be examined and revised cell capacities will be calculated based upon site-specific data and engineered designs. The results of the final design of the disposal cells will take into account the City's cell phasing preference in developing the both the configuration of the final alternative disposal cell footprints and the phasing sequence proposed in the FEIR.

Required Permits and Approvals

Development of any of the preferred alternative disposal sites will require permits and approvals from local, state and federal regulatory agencies. Table 1-5 provides a listing of the required permits and approvals for each of the three Preferred Alternatives. A complete analysis of the permitting requirements and specific regulatory standards for each of the permitting and approval programs is included in Section 7.0 of this DEIR.

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Table 1-5: Potential local, state and federal permits and approvals

JURISDICTION	PERMIT/ APPROVAL	AGENCY	AQUATIC DISPOSAL
			G-Cells, 1-4
FEDERAL	Section 10 Permit - Review of projects in navigable waters of the United States	Corps of Engineers	U
	Section 103 Permit - Approves transport of suitable dredged material to ocean disposal site	Corps of Engineers	U
	Section 404 Permit - Determines compliance with guidelines for discharges of dredged or fill materials into waters of the United States	Corps of Engineers	U
STATE	MCZM Consistency Concurrence - Evaluation of a project's consistency with MCZM's policies and management principles	MA Coastal Zone Management	U
	MEPA Certification on DEIR and FEIR - Decisions of Secretary of Environmental Affairs on DEIR and FEIR and compliance with MEPA	MA Environmental Policy Act	U
	Chapter 91 License - Approves structures/activities below mean low water mark	DEP: Division of Wetlands & Waterways	U
	Water Quality Certification - Controls impacts to water quality and determines compliance with state water quality standards	DEP: Division of Wetlands & Waterways	U
LOCAL	Wetlands Order of Conditions - Protection of Wetland Resource Area and compliance with WPA performance standards.	Local Conservation Commissions	U

Notes: Concurrence required for construction and operation of dewatering site. Structural or use changes associated with harbor-side dewatering may require approval.

1.2.6 Next Steps

The next key milestone in the DMMP Planning process is the development of the FEIR. After public and agency comments are received on this DEIR, and incorporated into the scope of the FEIR, the next phase of the DMMP will commence. The objective of study for the next phase for the Gloucester Harbor DMMP is to collect, analyze, and report site-specific information regarding geological, hydrodynamic, and biological conditions at the preferred alternative site locations. Approval of these sites by federal and state regulators, the City of Gloucester, and the general public requires the collection of additional environmental data to aid in the assessment of each site's suitability. In addition to the collection of site-specific environmental data, key management and policy issues will also be evaluated.

1.2.6.1 Disposal Site Monitoring Plan

A disposal site management and monitoring plan ("management plan") will be developed by a Technical Advisory Committee (TAC) composed of local, state, and federal interests. The purpose of a management plan is to determine the specific actions and responsibilities necessary to ensure that disposal site use protects human and environmental health and resources. A management plan addresses where, when, and how a disposal site can be used, what kind of short and long-term monitoring will be required, and establishes who is responsible for every aspect of site use, management, and monitoring. The management plan will also determine what kind of material can be safely disposed of, and what testing may necessary to determine the nature of the material proposed for disposal.

MCZM anticipates that comments from the City on this DEIR will recommend the appropriate local membership for the TAC. For the recent dredging project in Boston Harbor, the management plan was developed by a TAC composed of a core group of City representatives, state and federal agencies, scientists from UMASS and MIT, and environmental interest groups, and was open to any members of the public who wished to participate. This model may be appropriate to consider for Gloucester.

It is important to note that (1) the final, approved management plan will be the basis for the local, state and federal permits required for use of the disposal sites; and (2) no final approval for any disposal sites will occur until a management plan is developed, presented for public comment in the FEIR, and approved by the City, state and federal regulatory agencies.

1.2.6.2 CAD Cell Best Management Practices

MCZM is developing Best Management Practices (BMPs) for CAD of UDM in Gloucester Harbor based on the experiences and data from the Boston Harbor Navigation Improvement Project (BHNIP). The BMPs will be developed to be applicable as 1) stand alone guidelines, 2) the basis for new dredged material disposal regulations, and 3) the basis for site management recommendations in the DMMP FEIR. The BMPs will be developed to meet state and federal water quality criteria and standards under CWA s. 404, 314 CMR 9.00, other applicable regulations.

The BMPs will be designed to be effective regulatory tools, where ‘effective’ means:

- Appropriately protective of resources and uses;
- Cost-effective;
- Yield unambiguous results to the maximum extent practicable;
- Contribute directly to performance review (decision-making); and
- Applicable by non-specialist regulatory agency staff.

MCZM is also developing a model Water Quality Certificate (WQC) building upon the experiences of the BHNIP. This WQC will be applicable to future CAD projects for UDM. The WQC will include provisions for baseline monitoring and monitoring both during and post construction. Both the CAD BMPs and model WQC are being developed in coordination with the appropriate state and federal agencies.

1.2.6.3 Site-Specific Environmental Data

The expected impacts of the preferred alternative disposal sites were evaluated in this DEIR based upon the following: site-specific information gathered during the DMMP process; previous studies of Gloucester Harbor and the north shore region; studies done at other New England ports (e.g. Boston Harbor) and disposal sites, and laboratory studies of the effects of dredging and related activities. While the selection of the preferred alternative in this DEIR is supported by the above data, the DEIR recognizes that additional site-specific information is needed to complete the MEPA process and subsequent federal and state permitting. The following site-specific efforts will be undertaken in support of continuing the MEPA and/or permitting processes to develop final engineered designs:

- C Geotechnical borings to confirm depth to bedrock and determine side slope stability;
- C Macrobenthic sampling and identification
- C Current meter measurements and basic water column chemistry
- C Dredging and disposal event modeling and hydrodynamic analysis
- C Underwater archaeological surveys
- C Physical and chemical analysis of G-cell surficial sediments

Also in the FEIR, the development of long-term management strategy for UDM disposal will involve further study of: /site ownership/fees, site operations/management, liability and insurance.